

WHAT IS CLAIMED IS:

1. A method for crosslinking an extra cellular matrix layer in the vascular system of the body comprising:
providing a vascular catheter;
5 delivering a crosslinking agent to the extra cellular matrix layer with the vascular catheter; and
irradiating the extra cellular matrix layer and crosslinking agent with light energy emitted from the vascular catheter.

10 2. A method according to claim 1, wherein the crosslinking agent contains Riboflavin or Riboflavin-5-phosphate.

3. A method according to claim 2, wherein the wavelength of the irradiation energy is between about 200 nm and 500 nm.

15 4. A method according to claim 3, wherein the wavelength of the irradiation energy is between about 320 nm and 400 nm.

5. A method according to claim 1, wherein the crosslinking agent contains a saccharide or a phosphate derivative thereof.

6. A method according to claim 5, wherein the wavelength of the irradiation energy is between about 150 nm and 400 nm.

20 7. A method according to claim 6, wherein the crosslinking agent further contains traces of metals.

8. A method according to claim 5, wherein the crosslinking agent further contains a photosensitizer that generates oxygen radicals when irradiated.

25 9. A method according to claim 5, wherein the crosslinking agent further contains hydrogen peroxide.

10. A method according to claim 8, wherein the crosslinking agent further contains traces of metals.

11. A method according to claim 9, wherein the crosslinking agent further contains traces of metals.

12. A method according to claim 1, wherein the vascular catheter includes one or more light emitting diodes mounted thereon which provide the energy for the step of irradiating.

13. A method for crosslinking an extra cellular matrix layer in the vascular system of the body comprising:
5 delivering a saccharide to the extra cellular matrix layer; and
irradiating the extra cellular matrix layer and saccharide with light energy to crosslink the extra cellular matrix layer.

14. A method according to claim 13, wherein the wavelength of the light
10 energy is between about 150 and 450 nm.

15. A method according to claim 14, wherein the saccharide further contains traces of metals.

16. A method according to claim 13, wherein the saccharide further contains a photosensitizer that generates oxygen radicals when irradiated.

15 17. A method according to claim 13, wherein the saccharide further contains traces of metals.

18. A method according to claim 13, wherein the saccharide further contains hydrogen peroxide.

19. A method according to claim 18, wherein the saccharide further contains
20 traces of metals.

20. A method according to claim 13, wherein the saccharide is selected from the group consisting of:

glucose or a phosphate derivative thereof;
ribose or a phosphate derivative thereof; and
25 fructose or a phosphate derivative thereof.

21. A method according to claim 13, wherein the method includes delivering the saccharide to the extra cellular matrix layer and irradiating the extra cellular matrix layer and saccharide with light energy using a dual-purpose catheter.

22. A method for crosslinking an extra cellular matrix layer in the vascular
30 system of the body comprising:

delivering an agent selected from the group consisting of Riboflavin and Riboflavin-5-phosphate to the extra cellular matrix layer; and

irradiating the extra cellular matrix layer and Riboflavin or Riboflavin-5-phosphate with light energy to crosslink the extra cellular matrix layer.

5 23. A method according to claim 22, wherein the wavelength of the light energy is between about 200 nm and 500 nm.

 24. A method according to claim 23, wherein the wavelength of the light energy is about 220-225 nm, 266 nm, 371 nm, 444 nm, or 475 nm.

 25. A method according to claim 22, wherein the method includes delivering
10 the Riboflavin or Riboflavin-5-phosphate to the extra cellular matrix layer and irradiating the extra cellular matrix layer and Riboflavin or Riboflavin-5-phosphate with light energy using a dual-purpose catheter.

 26. A method according to claim 22, wherein the agent further contains hydrogen peroxide.

15 27. A method according to claim 22, wherein the agent further contains traces of metals.

 28. A method for crosslinking an extra cellular matrix layer in the vascular system of the body comprising:

 delivering a photoxidizer to the extra cellular matrix layer; and

20 irradiating the extra cellular matrix layer and photoxidizer with light energy to crosslink the extra cellular matrix layer.

 29. A vascular catheter for delivering light energy to a blood vessel wall comprising:

 a light-emitting diode (LED) on the distal end of the catheter,

25 a transparent balloon mounted over the LED; and

 a lumen opening distal and proximal to the balloon.

 30. The catheter of claim 29, wherein the lumen is of sufficient size for blood perfusion therethrough.

 31. The catheter of claim 29, further including a guidewire, wherein the lumen
30 is of sufficient size to function as a lumen for passage of the guidewire.

32. The catheter of claim 29, wherein the balloon is mounted eccentrically onto the balloon to create a void between the catheter and the body vessel for perfusion of the vessel distal to the catheter.

33. The catheter of claim 29, wherein the balloon forms a cavity between the
5 outer surface of the balloon and the vessel wall for holding a therapeutic agent.

34. The catheter of claim 33, wherein the balloon has a dog-bone shape.

35. The catheter of claim 29, further comprising:
a photo-sensitive agent contained in the balloon.

36. The catheter of claim 29, wherein there are at least two balloons mounted
10 parallel to each other, and wherein the inflation of the balloons creates a void between the balloons, the catheter, and the vessel wall for perfusion of the vessel distal to the catheter.

37. The catheter of claim 36, wherein there are just two balloons mounted on opposite sides of the catheter and one is larger than the other and covers the LED.

38. The catheter of claim 36, wherein there are four balloons mounted along
15 longitudinal quadrants of the catheter and connected to at least two inflation lumens.

39. The catheter of claim 36, wherein there are four arrays of axially spaced LEDs mounted along the catheter and beneath the respective balloons.

40. The catheter of claim 29, wherein the balloon is permeable.

41. The catheter of claim 29, wherein there is a permeable balloon and a non-
20 permeable balloon, and wherein the non-permeable balloon is contained within the permeable balloon.

42. The catheter of claim 40, wherein the balloon contains a photo-sensitive agent.

43. The catheter of claim 40, wherein the balloon contains a crosslinking
25 agent.